Technical Report 679

The Delayed Entry Program: A Policy Analysis

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This research explores the effect of the Delayed Entry Program (DEP) on preaccession and first-term behavior of Army enlisted personnel. Two models, one exploring the DEP and preaccession behavior (DEP LOSS) and the other examining the impact of the DEP on first-term attrition, are combined to explore DEP policy trade-offs. Recruiting costs and training costs are used as a measure of DEP impact on force management. Specific Military Occupational Specialties (MOS) are examined and marginal cost measures are developed.

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20. (Continued)

Results show that when cost is considered, longer DEP lengths are recommended, when possible, for almost all personnel. Findings show that marginal costs vary by personnel characteristics and MOS job assignment. Keywords:

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FOREWORD

The Manpower Personnel Policy Research Group of the Army Research Institute for the Behavioral and Social Sciences is concerned with understanding how Army personnel policy affects enlistment. This research is another step in the process of investigating and measuring the tradeoffs involved in personnel planning. Measuring the impact of various policies and incentives on in-service behavior may lead to improvements in how Army personnel resources are managed.

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THE DELAYED ENTRY PROGRAM: A POLICY ANALYSIS

EXECUTIVE SUMMARY

Requirement:

The time an individual remains in the Delayed Entry Program (DEP) has been shown to affect personnel losses while enrolled in the program (DEP loss) as well as losses after accession (attrition). These losses have proven extremely costly to the Army. A model is developed in this report to examine this effect and recommend minimum cost DEP lengths that are both personnel supply group- and MOS-specific.

Procedure:

Past research has shown that as time in the DEP is increased, so does the probability of DEP loss. On the other hand, as time in DEP increases, the probability of attrition once in the service decreases. Results from DEP loss and attrition models (estimated using logistic regression) are combined into a conditional probability model, examining this trade-off. Microdata-level loss and cost estimates are made and these results are compared with FY83 enlistment contracts for 12 MOS. A sensitivity analysis is then performed to measure the effect of varying DEP lengths.

Findings:

Recommended DEP lengths were found to vary by MOS, personnel supply category, and supply categories within MOS. They are also dependent upon whether the objective is to minimize loss or cost. In all cases, the minimum loss point turned out to be shorter than that for minimum cost.

Male AFQT I-IIIA high school graduates and seniors were the least expensive regardless of DEP length. Females proved to be the most expensive. In most cases, the preferred DEP lengths were longer than was historically observed, with only 25% falling within range. The Army fared best in placing AFQT IIIA male and female high school seniors (49% and 43%, respectively, in the preferred ranges) and poorest with male non-high school graduates (about 7%).

Of the 12 occupations examined, MOS 05C (Radio Teletype Operator) and MOS 31M (Multichannel Communications Operator) were found to be most sensitive to time in DEP and MOS 13B (Cannon Crewman) the least.

Utilization of Findings:

The analysis has shown that a 1-month increase in DEP lengths could save the Army over $50 million. These savings would be greater for some groups

than others. Marginal savings would be greatest for male nongraduates and females.

DEP policy should be MOS- and supply group-specific. When near-term training seats need to be filled, the use of male IIIB high school graduates is recommended when possible.

THE DELAYED ENTRY PROGRAM: A POLICY ANALYSIS

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THE DELAYED ENTRY PROGRAM: A POLICY ANALYSIS

I. INTRODUCTION

The Delayed Entry Program (DEP) has proven to be a valuable management tool for enlisting personnel into the Army. The DEP allows flexibility in matching enlisted people to Army jobs by permitting an individual a delay of up to 12 months before becoming an accession. This program enables the Army to coordinate accessions with training seats, thus evening out the training load during the year. The United States Army Recruiting Command (USAREC) regulates DEP policy for various individuals in different Army jobs.

Although it is agreed that the DEP is necessary and advantageous, formulating coherent policy is complex because both costs and benefits are associated with changing the DEP policy. Also, operational considerations often constrain the available policy choices. This research has the following purposes:

- Describe the effects of different DEP lengths for different categories of individuals, in terms of both preaccession and postaccession behavior.
- Develop a methodology that accounts for the positive and negative aspects of varying DEP lengths.
- Determine costs associated with the DEP and compute the marginal savings of altering the DEP lengths.
- Simulate the effect (measured in cost) of current policy and other policy alternatives.
- Formulate recommendations as to how current policy may be improved.

Section II provides a background of DEP research. Section III develops models to evaluate trade-offs with respect to reducing the loss of personnel and introduces cost considerations. Section IV compares existing DEP lengths with recommended DEP lengths. Section V performs sensitivity analyses and computes marginal savings or loss of changing the DEP length, and section VI presents conclusions and recommendations.

II. BACKGROUND

To provide an understanding of the Delayed Entry Program (DEP) and its relationship to DEP loss and attrition, a short description of the Army enlistment process from the point of contract is necessary. Figure 1 provides a flow diagram including three important decision points. The first occurs at the signing of an enlistment contract. The individual must decide whether to "direct ship" (become an immediate accession) or enter the DEP. Currently, almost all recruits enter the DEP. Schmitz and Nelson (1984) found that in FY81 more than 98 percent of those signing contracts were DEP participants. This analysis is concerned with those individuals who enter the DEP.

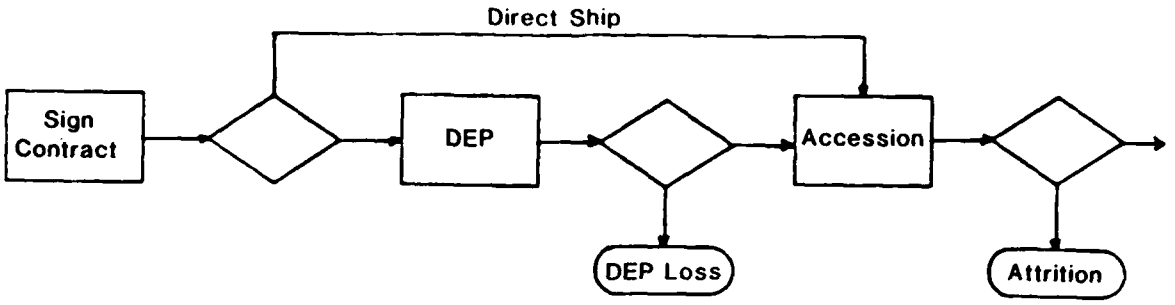

Figure 1. The U.S. Army enlistment process.

The second decision point involves whether or not to drop out of the DEP prior to accession. Because an individual who leaves the DEP (DEP loss) is breaking a legally binding contract, the Army has the option of prosecuting DEP dropouts if it so desires. The Army does not usually exercise this option, however, because forcing these individuals to enlist might not produce the desired results. Individuals dropping out of the DEP may be poorly motivated (as shown by their failure to fulfill a legally binding contract) and therefore would not become good soldiers. Also, some might attrite at a later date, after a more sizable investment in training has been made. Thus, the DEP might serve as a screening device, with self-selection of individuals (Salop & Salop, 1976).

The final decision point important for this analysis occurs after accession and involves attrition before completion of the first term. (Attrition occurs when an individual leaves the Army without completing the term of service.)

The DEP aids the recruiting process by serving as a sales tool. It enables a qualified individual to select a particular job or Military Occupational Specialty (MOS) even if the training seats are available several months hence. In the interim, the recruit is free to remain in his or her neighborhood, possibly influencing peers. Friends are also encouraged to join participants at DEP functions where future careers are discussed. Perhaps the DEP's greatest advantage is that it permits the Army to recruit high school seniors prior to graduation, when large numbers of individuals can be reached at the same time and when these individuals have not been fully exposed to the job market and therefore may be likely to pursue Army careers. The Army also uses the DEP to even the flow of accessions during the year, smoothing out recruiting seasonality to match training seats.

Several researchers have discovered that DEP participation leads to lower first-term attrition. Buddin (1981) found lower posttraining attrition rates among DEP participants. Flyer and Elster (1983) showed that those accessing after a "significant" DEP period had lower attrition than direct ships. Manganaris and Schmitz (1985) further examined the DEP-attrition relationship, finding that length of DEP is inversely related to attrition. They also discovered loss rates to be MOS-specific.

The DEP also has negative aspects. The recruiter is responsible for keeping track of recruits in the DEP. If a recruit drops out, the recruiter must

find a suitable replacement. These responsibilities detract from time the recruiter can spend attracting other candidates.

By far, the greatest problem associated with the DEP is that of DEP loss (DEP loss occurs any time a person drops out of the DEP prior to accession). The number of losses has increased in recent years, rising from 8.4% in FY81 (Celeste, 1984) to more than 11% in FY84 (Maze, 1984). Phillips and Schmitz (1985) developed a model predicting DEP loss as a function of sociodemographic and policy variables. They found that DEP loss is positively and significantly related to time in the DEP for all individuals.

Several factors determine the length of the DEP for a particular individual:

- Current Army DEP policy for the individual's supply category (defined by gender, education, and test scores)
- Training seat scheduling
- Personal preference
- Educational status
- Near-term need to fill

These constraints are constantly subject to change, depending on current requirements and desired quality. (Typically, high school seniors are permitted to remain in the DEP the longest, and females and non-high school graduates the shortest.)

III. THE DEP LOSS-ATTRITION TRADE-OFF MODEL

The DEP has both positive and negative aspects, so the task of determining an optimal DEP length becomes one of "balancing" DEP loss and attrition. Therefore, this research will develop a way to estimate optimal or near optimal DEP lengths to provide rational policy recommendations. To accomplish this, the following steps will be taken:

- Determine the total loss by combining DEP loss and attrition models.
- Formulate a total cost model by weighting the loss model with recruiting and training costs.
- Estimate preferred DEP assignments by MOS and category of individual.
- Compare preferred DEP assignments with historical observations and examine the sensitivity of results.
- Recommend policies to reduce recruiting and training expenditures.

This section will perform the trade-off model development, and the balance of the paper will concentrate on analysis of the results.

Total Loss Model

Total loss (TL) is defined as the probability of an individual being lost from time of contract through the second year of enlistment. For purposes of this analysis, DEP loss will be estimated using the results from Phillips and Schmitz (1985). They found that both time in DEP and personal characteristics affect DEP loss (see Appendix A). The attrition side will be drawn from the work of Manganaris and Schmitz (1985), whose analysis showed that time in DEP, personal characteristics, and MOS affect attrition significantly (see Appendix B). Results from both models are in the form of logistic regression estimates, and therefore TL will be expressed in probabilistic terms.

Equation 1 shows how TL is computed. TL is not simply the sum of the probabilities of DEP loss and attrition; someone who becomes a DEP loss cannot later attrite, and so the TL probability is conditional.

$$TL = P(d) + [1 - P(d)]P(a) \qquad (1)$$

where

TL = total loss
P(d) = the probability of DEP loss
P(a) = the probability of attrition

Figure 2 shows the TL, attrition, and DEP loss curves for a male high school graduate, Armed Forces Qualification Test (AFQT) 60 (scale: 1-99, scores 50 or higher being above average), in MOS 31M (Multichannel Communications Equipment Operator). The low point on the total loss curve (M*) shows the minimum probability of loss (P*) and the corresponding DEP length (D*). Five months would be the optimal DEP length for this individual assigned to this MOS. (Complete TL model results are included in Appendix C.)

Three weighting schemes were considered for the trade-off model:

- Equal weighting
- Relative weights
- Cost minimization

Total loss as shown above uses equal or unit weighting, which implies that both attributes (DEP loss and attrition) are equally important (Edwards & Newman, 1982). Because different costs are associated with DEP loss and attrition, DEP loss and attrition were not considered equally for purposes of this research. Therefore, two alternative approaches were examined.

Relative weighting is a way of assigning values to certain outcomes to show that one alternative is preferred over another. Often these weights are determined judgmentally through a process involving one or more decision makers. Although this approach was not taken, the reader should be aware of this alternative. A considerable body of literature is devoted to relative weighting schemes (see Stokey & Zeckhauser, 1978; or Abrams, 1980).

Because no decision makers have been involved thus far, cost was chosen as the preferred weighting method. Costs often reflect real world consideration

given to decisions in both business and government. Although costs are sometimes difficult to determine, in this research it may be a reasonable approach, and the total cost model is described in the following section.

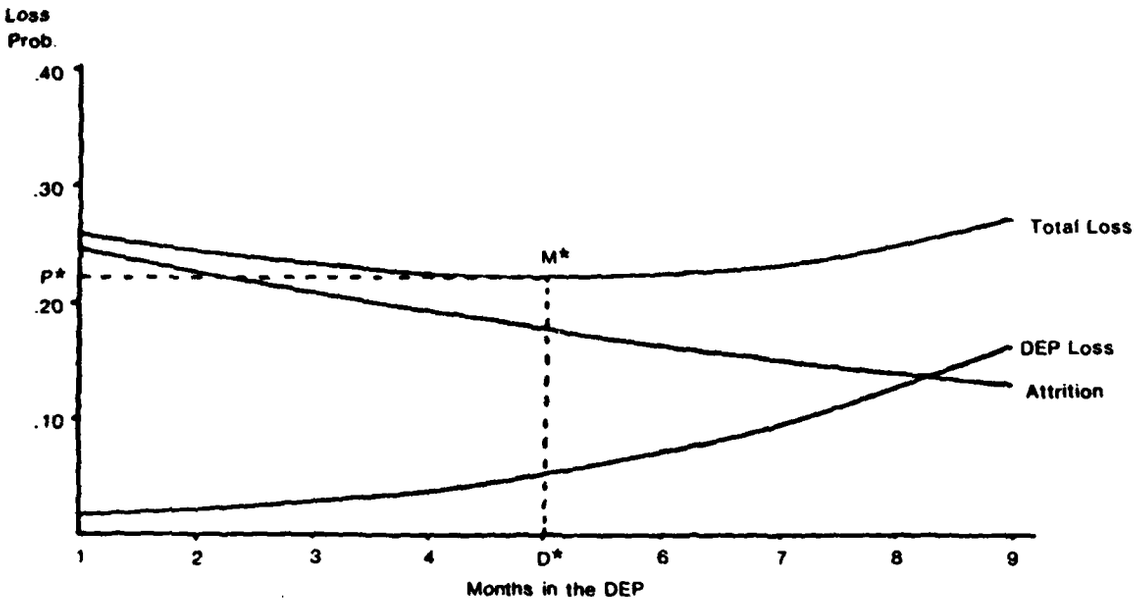

Figure 2. Total loss composition, male I-IIIA high school graduate, MOS 31M.

Total Cost Model

The formulation of the total cost (TC) model is similar to that of the TL model, except that the costs of recruiting and training an individual are considered. Equation 2 shows how total cost is computed.

$$TC = P(d)(RC) + [P(a)(1-P(d))](TRC + RC) + MC \qquad (2)$$

where

TC = total cost
P(d) = probability of DEP loss
RC = recruiting cost
MC = DEP management cost
P(a) = probability of attrition
TRC = training cost

Recruiting costs were obtained from the 1982 U.S. Army Audit Agency report on the cost of recruiting. Both direct and indirect recruiting costs were calculated in the report. Direct costs include the salaries of recruiting personnel and recruiter aides, vehicles, recruiter expenses, guidance counselor salaries, testing and examining, enlistment bonuses, and applicant meals and lodging. Indirect costs include operating expenses other than salary

of recruiting companies, brigades, and stations and advertising. Recruiting cost per individual by supply category is as follows:

Male high school graduates and seniors	$ 4,863
Male nongraduates	1,235
Female high school graduates and seniors	5,861

(Recruiting costs were adjusted to FY83 dollars by increasing FY82 estimates by 10%.)

DEP management costs proved to be more difficult to measure. The question was how much recruiter time is allocated to keeping track of persons in the DEP. Because a precise measure of this cost could not be obtained, it was assumed that a recruiter spends approximately 2 hours per month keeping track of an individual, at a cost of $20 per hour. Included are periodic telephone contact and the organizing of DEP functions. Together, recruiting and DEP management costs constitute the estimated costs of the DEP.

Until January 1985 an additional cost to the DEP was counting the time an individual remained in the DEP toward longevity payments. This practice translated into more rapid advancement in pay grade and also time in service toward retirement. It was found not to be cost effective and was therefore discontinued (see GAO report, Cost and Benefits of Longevity Payments for Time Spent in the Delayed Entry Program, 1984).

Training costs are incurred only for those individuals who become accessions and vary considerably by MOS. Training costs, obtained from the Cost Analysis Division of the Army Finance & Accounting Center (Military Occupational Specialty Training Cost Handbook, 1983), are shown in Table 1.

Table 1

Training Cost by MOS

MOS		Training Cost
05C	Radio Teletype Operator	$31,636
11X	Infantryman	27,473
13B	Cannon Crewman	24,272
16J	Defense Acquisition Radar Operator	31,463
31M	Multichannel Comm. Equip. Oper.	24,722
64C	Motor Transport Operator	24,200
67N	Utility Helicopter Repairer	26,680
71L	Administrative Specialist	15,033
76P	Materiel Control & Acct. Spec.	18,510
76Y	Unit Supply Specialist	20,273
91B	Medical Specialist	18,103
94B	Food Service Specialist	22,029
95B	Military Police	22,035

The training costs represent all variable costs associated with military pay and allowances for the enlistee, faculty, staff, and military support staff. Also included are recurring operating expenses such as ammunition and the replacement costs of training equipment. These MOS were chosen because they have a large number of accessions and represent a wide variety of skills and occupations.

Table 2 shows a typical TC computation, the expected cost of a male AFQT I-IIIA (score of 50 or above) high school graduate in MOS 31M at a DEP length of 2 months.

Table 2

Cost Calculation

Recruiting cost	$ 4,863
DEP management cost (2x2x20) =	80
Training cost (MOS 31M)	24,722
DEP loss probability (2 months)	.03
Attrition probability (2 months)	.24
Predicted total cost/individual =	
.03(4,863)+(1 - .03)(.24)(4,863 + 24,722)+80 =	$ 7,033.00

Sensitivity to time in DEP was found to be MOS-specific. This is clearly seen in Figure 3, which shows TC curves for a male I-IIIA high school graduate in three different MOS (11X, 31M, and 71L), varying time in DEP from 1 to 9 months (all results discussed are in terms of white individuals because race and ethnic differences are not central to this analysis). In each case the curve is negatively sloping, achieving the minimum cost at 9 months. (This slope remained true for all combinations examined). MOS 71L was least sensitive to time in DEP. While the cost difference (less than $500) between MOS 11X and 31M is relatively small at DEP periods of less than 2 months, at longer periods the gap widens (up to $1,300) due to differences in MOS sensitivity.

Similar results were obtained when examining supply categories within an MOS. In Figure 4, a male I-IIIA high school graduate in MOS 31M is compared to a male I-IIIA nongraduate and a female high school graduate in the same MOS. The male graduate is by far the least expensive. At 1 month in the DEP the male graduate is projected to cost approximately $3,000 less than the male nongraduate and more than $6,000 less than the female high school graduate. The gap narrows to about $1,400 and $3,500, respectively, at 9 months in the DEP.

It would not be reasonable for policy purposes to assume that the minimum cost point predicted by the trade-off model is necessarily the optimum DEP length. Factors such as need to fill and individual differences must be considered. Also, the model was developed using estimated probabilities and

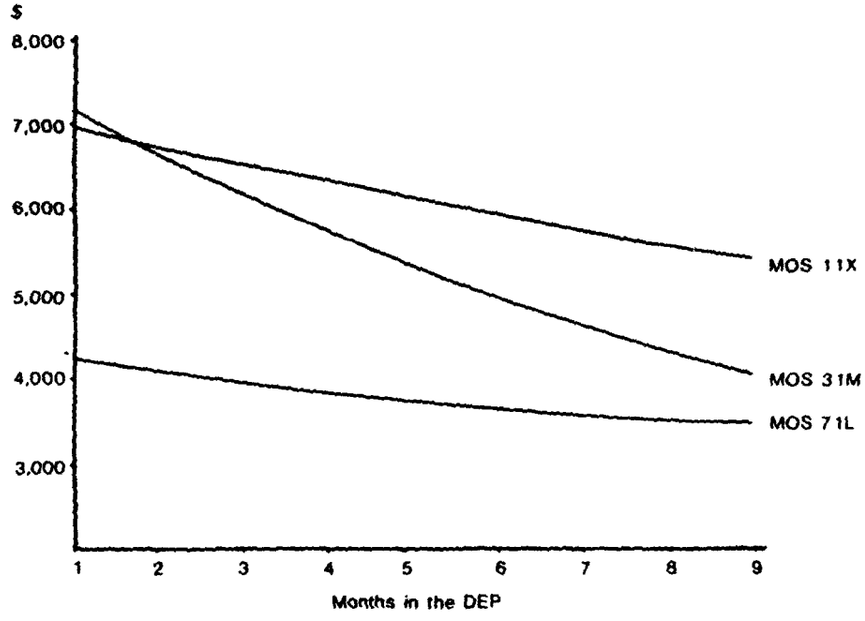

Figure 3. Total cost curves, MOS sensitivity to time in DEP, male I-IIIA high school graduate.

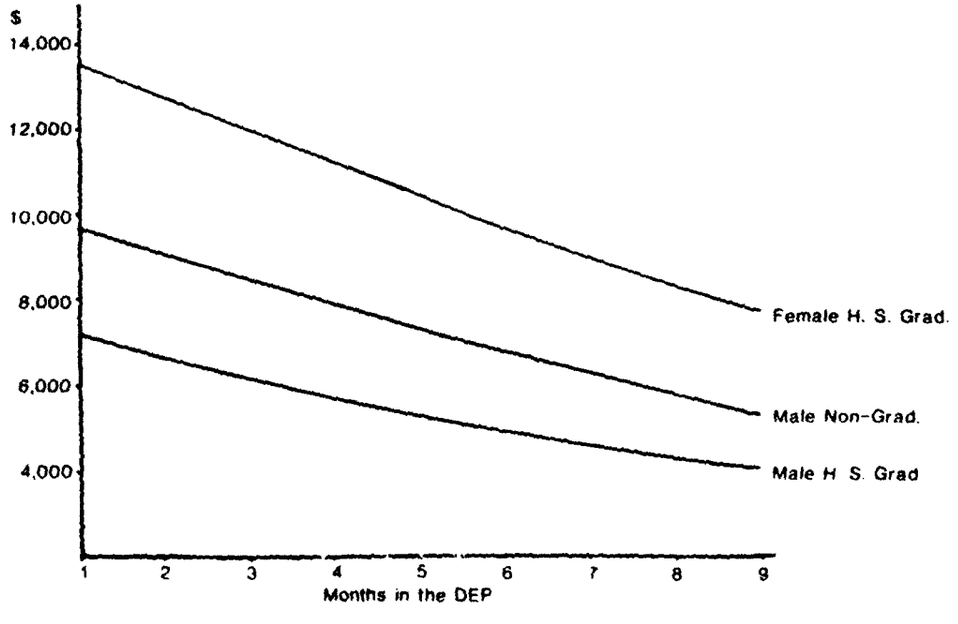

Figure 4. Total cost curves, education and gender effect, MOS 31M.

costs. Therefore, a preferred range was used for policy analysis. This preferred range was defined as any value on the cost curve 10% or less above the minimum value (or 9 months if the minimum occurs at a later point). For example, if the minimum cost were $5,000, any DEP length with a cost of $5,500 or less would be included in the preferred range. As shown in Figure 5, the preferred range varies by MOS. In general, the steeper the slope of the cost curve as DEP increases, the narrower the preferred range. Among the examined MOSs (Table 3), the broadest preferred ranges were found in MOS 13B and the narrowest in MOS 05C and 31M. Ranges also vary by supply category within MOS.

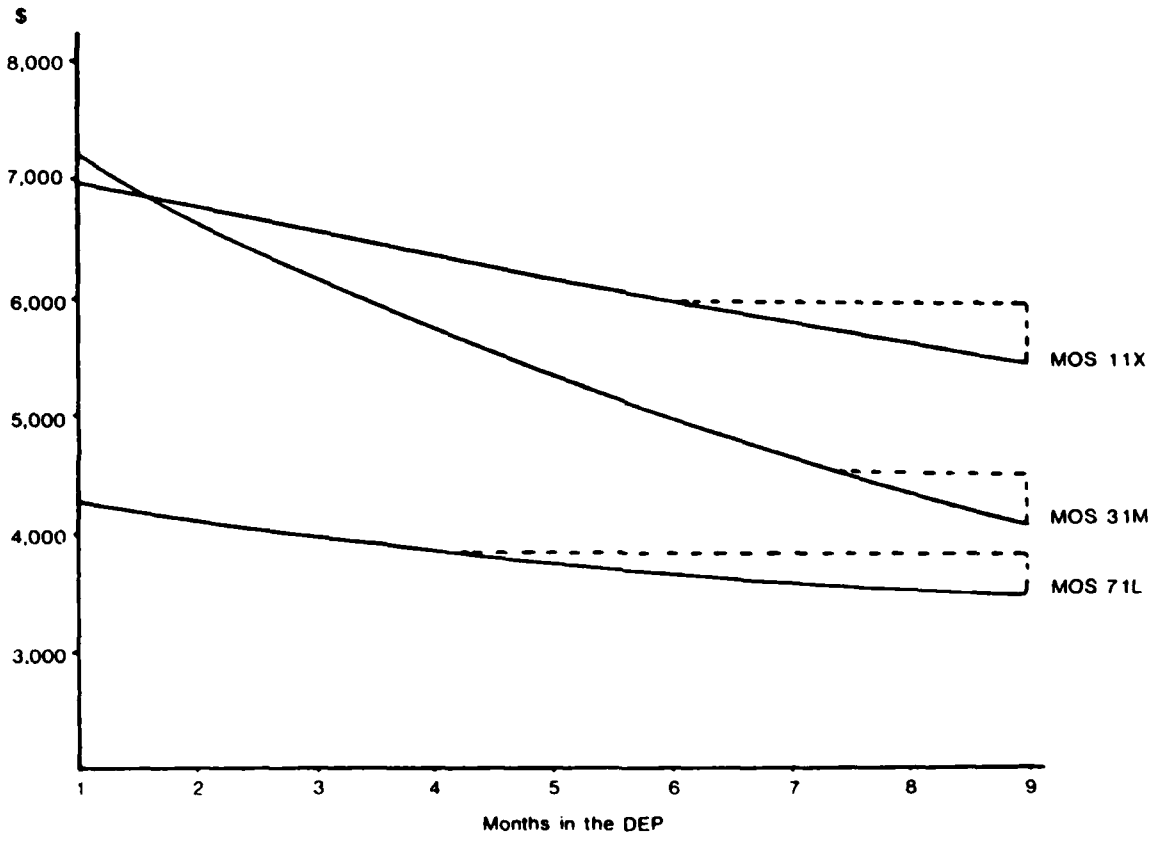

Figure 5. Preferred DEP ranges, male I-IIIA high school graduate.

Preferred ranges by supply category are included in Table 4; these values also vary across MOS. In general, the broadest ranges were found for male seniors and graduates and the narrowest for male nongraduates and all females.

As previously stated, several factors influence DEP length, including those controlled by Army policy and by the individual. DEP length can vary widely, even within supply category. Table 5 shows DEP distributions for

Table 3

Preferred DEP Range in Months by MOS

MOS	Lowest	Highest
05C	8	9
11X	6	9
13B	2	9
31M	8	9
64C	6	9
67N	7	9
71L	5	9
76P	4	9
76Y	6	9
91B	6	9
94B	6	9
95B	6	9

Table 4

Preferred DEP Range in Months by Supply Category

Category	Lowest	Highest
I-IIIA male grad.	3	9
III male grad.	4	9
IV male grad.	4	9
I-IIIA male senior	2	9
IIIB male senior	2	9
IV male senior	2	9
I-IIIA male nongrad.	6	9
IIIB male nongrad.	6	9
I-IIIA female grad.	6	9
IIIB female grad.	7	9
I-IIIA female senior	6	9
IIIB female senior	6	9

actual FY83 contracts, by educational categories. Graduates and nongraduates (at time of contract) displayed similar patterns, both having a mean DEP period of 3.4 months and a median of 2.9 months. The effects of different DEP constraints for seniors are clearly apparent, with this group exhibiting mean and median DEP periods of 5.3 and 4.8 months, respectively.

Table 5

DEP Percentage Distribution in Months for FY83 Contracts

Months in DEP	High school grads	Nongrads	High school seniors
1	9.25	9.43	6.15
2	15.44	12.04	7.18
3	28.23	32.91	13.13
4	19.49	19.56	13.56
5	11.80	11.11	12.88
6	6.08	5.70	9.79
7	2.71	2.30	8.51
8	1.51	1.18	7.13
9	.92	.68	5.95
10	.90	.77	4.96
11	1.33	1.51	4.62
12	2.33	2.81	6.15
Mean months	3.4	3.4	5.3
Median months	2.9	2.9	4.8
Total	85,346	22,105	51,095

IV. COMPARISON ANALYSIS

The theoretical model developed above determined guidelines for desirable DEP policy. But how closely does actual DEP policy match the model? Presumably, if a substantial majority of assignments are made within the preferred range, then current DEP policies would be reasonable. But if most assignments conflict with model guidance, then it may imply possible cost savings.

Accordingly, this section compares recent historical DEP policies to model results and identifies alternative policies that should benefit the Army.

Using FY83 data, an experiment was conducted to examine how many actual DEP assignments fell within the preferred ranges. Twelve MOS were analyzed, containing over 66,000 observations. Table 6 shows the actual median, the estimated preferred range, and the percentage that fell within the preferred range for 12 supply categories. AFQT I-IIIA seniors, both male and female, had the highest percentage falling in the preferred range. Nongraduate males and lower AFQT graduate females had the lowest percentage of assignments

falling in the preferred range. Overall, higher AFQT category seniors were assigned in preferred ranges most often, followed by high school graduates. Nongraduates were assigned to preferred ranges least often. Males also fared better than females.

As clearly shown, in no case were most DEP assignments within the preferred range.

Table 6

Results of Actual versus Preferred Range Comparison in Months

Group	Actual median	Preferred range	Percent in range
I-IIIA male grad.	3.0	5.8-9	23.4
IIIB male grad.	2.8	6.6-9	14.3
IV male grad.	2.4	6.6-9	6.4
I-IIIA male senior	5.1	6.4-9	49.4
IIIB male senior	4.9	6.6-9	46.3
IV male senior	2.9	6.6-9	16.5
I-IIIA male nongrad.	2.9	7.4-9	8.2
IIIB-IV male nongrad.	2.7	7.4-9	6.6
I-IIIA female grad.	3.4	7.4-9	17.7
IIIB female grad.	2.6	7.5-9	3.5
I-IIIA female senior	5.3	7.0-9	43.0
IIIB female senior	2.8	7.2-9	10.4

V. SENSITIVITY ANALYSIS

Marginal Savings

Actual DEP lengths fall short of most preferred DEP ranges, so an increase in average DEP length would result in cost reductions. Using the FY83 data, a cost savings of $24 million would be expected if all observed DEP lengths in the 12 MOS except those already assigned a 12-month DEP were lengthened by 1 month. Assuming that these savings would be consistent throughout the MOS force structure, a total of $52.8 million could have been saved in FY83. Other alternatives also show substantial savings. For example, if the DEP distribution for AFQT I-IIIA graduates and seniors, both male and female, remained unchanged but all other DEP lengths were increased by 1 month, the expected FY83 savings for the total force would be $30.1 million. Alternatively, if DEP lengths of male and female seniors remained unchanged but all others were lengthened by 1 month, the total savings would be in the order of $39.3 million. These savings are based on the sum of all marginal

savings associated with lengthening the DEP 1 month. Appendix D shows the marginal savings for each personnel category by MOS and months in the DEP.

The marginal savings of lengthening an individual's DEP assignment 1 month for all personnel supply groups are shown in Table 7. Females have the largest marginal savings overall. Among males, nongraduates have the highest marginal savings.

Table 7

Average Marginal Savings by Personnel Category

Category	Marginal savings/individuals
I-IIIA male graduate	$137
IIIB male graduate	178
IV male graduate	206
I-IIIA male senior	155
IIIB male senior	187
IV male senior	216
I-IIIA male nongraduate	314
IIIB male nongraduate	335
IV male nongraduate	350
I-IIIA female graduate	418
IIIB female graduate	467
I-IIIA female senior	375
IIIB female senior	393

In some instances, the need to achieve minimum loss may override the importance of minimizing cost. This is particularly true for male I-IIIA graduates, who are highly sought after for Army jobs but are also supply constrained. Assigning long DEP lengths may achieve lower costs, but may not have the desired results. For example, for a male I-IIIA high school graduate in MOS 11X, minimum cost is achieved at a length of 9 months or more (figure 5), but the minimum loss is achieved at 3 months (see Figure 1C, Appendix C). Any increase in DEP past the 3-month point would result in greater personnel losses. At the 3-month point the loss probability is approximately .22; raising the DEP length to 9 months, however, would increase the loss probability to .3. On the basis of 6,500 I-IIIA male high school graduate contracts per year in MOS 11X, this is a difference of 520 losses for this MOS alone. Therefore, minimizing total loss rather than cost could be considered for this or any other category of individual that is both highly desirable and supply constrained.

Immediate Accession Needs

The analysis shows that costs can be lowered by lengthening the average DEP enlistment, but this is not always practical. Training seats often remain unfilled in the immediate term (referring to the next month or two) either because they require special skills or are not as attractive as other jobs. Although little insight can be gained from this analysis for the former case, the results can be directly applied to the latter. These MOS must be filled, in many cases, by directing individuals to jobs.

As previously indicated, cost savings associated with lengthening the DEP enlistment vary by supply category and MOS. The effect of shortening the DEP enlistment was examined to determine the least costly individuals to fill immediate accession needs. Overall, results were similar to those found in the previous section. The same supply categories having low marginal savings per individual (male high school graduates and seniors) also had the lowest marginal cost increases when shortening DEP lengths by 1 month. The largest increases occurred for females and nongraduate males.

Before comparing supply categories to determine the most suitable category (in terms of cost) to fill immediate needs, it must be stated that not all types of individuals can or should be used equally to fill these positions. Throughout most of the year, high school seniors cannot access. A problem also arises when using male AFQT I-IIIA high school graduates because they are highly sought after by the Army and are in limited supply. For this reason, individual preferences may have to override immediate accession restrictions, lest the individual be lost before contracting. Also, female graduates cannot always be used because of their exclusion from combat-related MOS. In addition, female graduates were found to be extremely expensive at short DEP periods. With the exclusion of those in the above categories, the only substantial numbers of individuals available for such assignments are male AFQT IIIB and IV graduates and all male nongraduates.

Male I-IIIA nongraduates were more expensive than IIIB high school graduates in all cases. At 1-month DEP, cost differences between the two groups ranged from $942 (MOS 71L) to $5,249 (MOS 05C) with a mean difference of about $2,500. Figure 6 illustrates cost differences in MOS 31M. At 1 month in the DEP, the difference between the two categories is over $1,400. In fact, the IIIB graduate at 1-month DEP remained less expensive than the I-IIIA nongraduate at all lengths less than 3.5 months. In some cases, graduates at 1 month remained less expensive than the nongraduate at any length. AFQT IIIB graduates would also have a lower marginal cost increase if DEP were shortened.

VI. CONCLUSION

The DEP loss-attrition trade-off model has shown how the achievement of the goals of one part of an organization may impede attainment of another organizational goal. Minimizing DEP loss (by shortening the DEP enlistment) may aid recruiting, but can lead to higher attrition and therefore increased personnel costs. This analysis shows the importance of considering DEP loss and attrition simultaneously when developing DEP policy. When FY83 contracts were applied to the DEP loss-attrition model, it was shown that considerable savings were achieved by changing DEP policy.

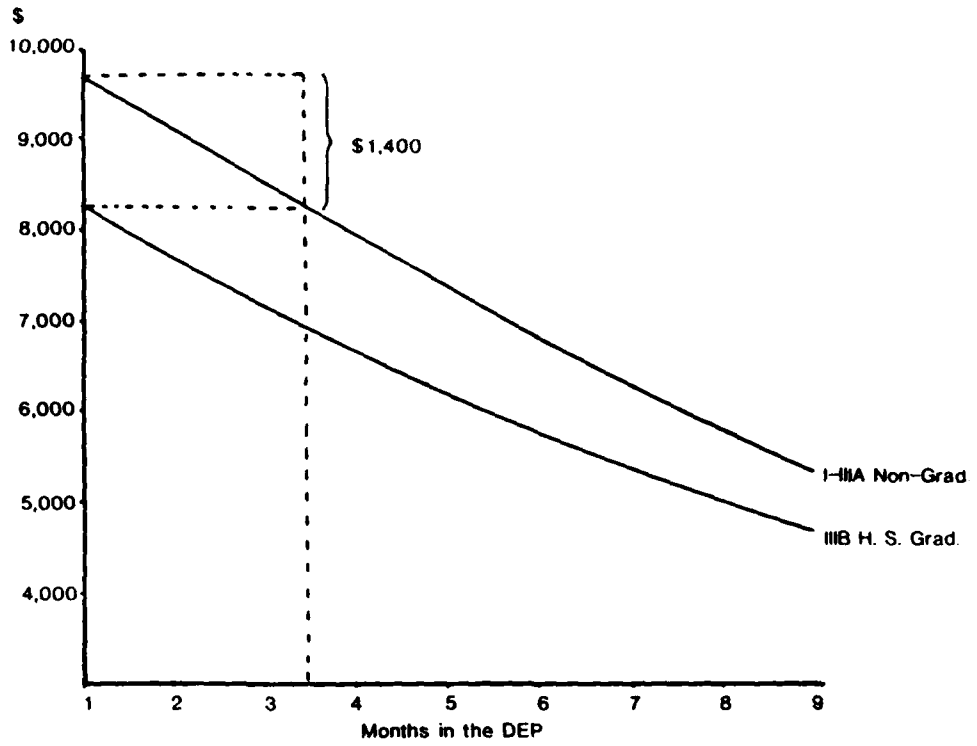

Figure 6. Total cost curves, I-IIIA male nongraduate versus IIIB high school graduate in MOS 31M.

Thus, to minimize cost, several policy options are recommended:

- DEP lengths should not be shortened, but should be lengthened wherever possible.
- When immediate-term seats must be filled, the use of IIIB male graduates is recommended.
- DEP policy should be MOS-specific.
- Supply category-specific DEP policies should also be followed.
- A mandatory minimum DEP period for nongraduate males and graduate females should be considered.

The analysis shows that it is almost always less expensive to keep an individual in the DEP for a longer period, that relatively few DEP participants fall in the preferred ranges, and that substantial savings could be achieved simply by lengthening DEP periods 1 month for some or all personnel groups.

This analysis also shows that when immediate term accession needs must be filled, two factors should be taken into account: total loss and cost. Male IIIB graduates are relatively cost effective at short DEP lengths and present a less expensive alternative to I-IIIA nongraduates. Although male I-IIIA graduates could provide a lower cost alternative, this high-quality group is in limited supply and therefore valuable. Even though male I-IIIA graduates might be less expensive in the short run, extremely short DEP periods would result in higher attrition losses, an undesirable outcome when using high-quality individuals.

An MOS-specific DEP policy should be followed. Results show that some MOS are more sensitive to time in the DEP than others. Also, training costs vary across MOS, so some jobs have much higher costs than others at equal DEP periods. Those with greatest marginal savings should be considered for longer DEP periods.

The Army currently employs supply category-specific DEP policies and should continue to do so. With these results it can improve the allocation process, taking into account the costs associated with different DEP lengths.

Male nongraduates and females were found to be the most expensive at the shortest DEP lengths but also to have the largest marginal savings for increased DEP due to the high projected attrition rates for both groups (in addition to high recruiting costs for females). A mandatory DEP enlistment could benefit the Army, allowing less motivated individuals to leave the system before accession. Increasing DEP length by 1 to 3 months for I-IIIA male nongraduates would save an average of approximately $675 per individual among the 12 MOS examined.

The Army currently has the mechanism to implement some of these changes. Alterations in policy can be specified on DEP control messages, alerting Army guidance couselors. If DEP periods were increased, greater DEP loss would necessitate a short-term increase in available recruiting resources. This increase may be desirable, however, because less motivated individuals would self-select themselves out of the system. Any increase would be short-lived, being gradually offset by decreases in attrition.

The MOSs used in this analysis were selected because they provided a cross-section of Army occupations. It can therefore be assumed that these results are generalizable across most MOS, with costs decreasing when DEP is increased. This assumption holds only within reasonable bounds, however. It is not recommended that the Army DEP all individuals 12 months, even if possible. Incremental changes should be made, as shown when DEP periods were lengthened by 1 month. Factors beyond the scope of this analysis must also be considered, such as performance differences across supply categories (for example between I-IIIA male nongraduates and IIIB high school graduates).

This analysis shows the important relationships between DEP length, DEP loss, and first-term attrition. When costs alone are considered, marginal increases in average DEP length will produce substantial savings. Present and future decision makers should consider these relationships to formulate coherent policies that emphasize the manpower and personnel goals of the Army as a whole.

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APPENDIX A

DEP LOSS MODEL SPECIFICATIONS

Estimates used in the DEP loss portion of the DEP loss-attrition policy analysis are from an updated version of the model developed by Phillips and Schmitz (1984). The current model differs from that work, however, in several respects. Where the Phillips and Schmitz model aggregated high school graduates and nongraduates in a single equation, we have estimated separate equations for each group. This is because there are certain enlistment incentives offered only to graduates. Prior military service was also included in the new model. This variable was found to be significant for high school graduates.

The updated DEP loss models were estimated from random samples taken from FY83 contracts (approximately 13,000 from each supply group), using a maximum likelihood logistic regression (logit) model. Most of the variables were in dichotomous (0,1) form with the exception of days in the DEP and AFQT that were continuous. Other variables used in the analysis include race (white, non-white), age (17 versus 18-19 in the senior model and under 20 versus 20 and over in the high school graduate and nongraduate models), gender, and prior service. The Army College Fund (AFC) and enlistment bonuses were included in the senior and graduate models.

The probability of DEP loss was the dependent variable. Equation 1A shows the general logit form. Logit models are particularly well suited in cases such as this, where dichotomous variables are used. Based upon the cumulative logistic probability function, the maximum likelihood logit restricts values of the dependent variable to between 0 and 1. Continuous variables may also be used and parameter estimates are consistent and efficient. A more detailed discussion of the logit can be found in Pindyck and Rubinfeld (1981) and Amemiya (1981).

Equation 1A

$$P(i) = \frac{1}{1 + e^{-(A+Bx(i))}} \qquad (1A)$$

where

P(i) = Probability of individual becoming a DEP loss
A = Intercept
B = Beta Coefficient of independent variable
x(i) = Characteristics of the contract

Logit results can be seen on Tables A-1 through A-3. These three tables show beta coefficients, standard errors, and elasticities for the independent variables along with level of significance. In all three models days in DEP (+) gender (+ for female), age (+ for older contracts), and race (- for non-whites) were significant at the .01 level. AFQT and enlistment bonuses proved not to be significant in any specification.

Table A-1

High School Graduate DEP Loss Model

Variable	Beta	STD error	E
Intercept	-4.0027***	.1635	
Nonwhite	-.2937***	.1028	-.075
Under 20	-.3861***	.0914	-.182
Prior service	.4022***	.1491	.032
2-year term	-.3382*	.1881	-.022
4-year term	-.1411	.1083	-.044
Bonus	-.1858	.1608	-.030
ACF	-.0523	.1157	-.017
AFQT	-.0005	.0024	-.033
Days in DEP	.0104***	.0004	1.012
Female	.9887***	.0958	.130

Dependent Variable = DEP loss
N = 12,676
Model Chi-square (10 D.F.) = 844.87 P = 0.0
-2 log likelihood = 5455.23

* SIG .1
*** SIG .01

Table A-2

High School Senior DEP Loss Model

Variable	Beta	STD error	E
Intercept	-4.3615***	.1715	
Nonwhite	-.2826***	.1028	-.061
Age 17	-.4364***	.0846	-.199
Prior service	.7524***	.3597	.009
2-year term	-.1953	.1564	-.016
4-year term	-.1420	.0973	-.047
Bonus	-.1712	.1380	-.029
ACF	-.2034**	.1040	-.073
AFQT	.0014	.0026	.073
Days in DEP	.0086***	.0005	1.448
Female	1.2518***	.0992	.119

Dependent Variable = DEP loss
N = 12,801
Model Chi-square (10 D.F.) = 547.32 P = 0.0
-2 log likelihood = 5804.99

** SIG .05
*** SIG .01

Table A-3

Non-High School Graduate DEP Loss Model

Variable	Beta	STD Error	E
Intercept	-2.7989***	.1301	
Nonwhite	- .2728***	.0844	-.057
Under 20	- .6037***	.0711	-.330
Prior service	.0352	.1080	-.004
2-year term	- .0972	.1635	-.003
4-year term	- .0002	.0742	.000
AFQT	- .0019	.0019	-.099
Days in DEP	.0067***	.0004	.633
Female	.8617***	.0846	.080

Dependent Variable = DEP Loss
N = 13,234
Model Chi-Square (8 D.F.) = 483-09 P = 0.0
-2 Log Likelihood = 7535.09

*** Sig .01

APPENDIX B

ATTRITION ESTIMATES

The following is a technical extract from the "Impact of Delayed Entry Program Participation on First Term Attrition" by Manganaris & Schmitz (1985). This extract provides MOS-specific logit regression estimates of attrition. These estimates were used in order to determine loss from attrition. Table B-1 shows the MOS used in the analysis, as well as the aptitude area score used for assignment, the required qualifying score and the number of cases for each equation estimated. Table B-2 shows the variables used.

Tables B-3, B-4, and B-5 show the elasticities and the reported chi-square values for the thirteen MOS used in the analysis. The logit r is also reported. The r can be interpreted as the percentage of explained variation. The dependent variable is the probability of attrition where 0 = No Attrition and 1 = Attrition. Attrition is defined as any individual separating from the Army without completing the contracted term of service, unless the individual reenlisted or left for officer candidate school (OCS).

Table B-1

MOS Used in Analysis

MOS	Descriptive Title	Aptitude area score	Qualifying score	Number of cases
05C	Radio Teletype Operator	SC	95	3,235
11B	Infantryman	CO	85	10,449
13B	Cannon Crewman	FA	85	4,081
16J	Defense Aquisition Radar Oper.	OF	95	536
31M	Multichannel Comm. Equip. Oper.	EL	95	1,662
64C	Motor Transport Operator	OF	95	3,628
67N	Utility Helicopter Repairer	MM	100	1,293
71L	Administrative Specialist	CL	95	3,076
76P	Material Control & Acct. Spec.	CL	90	4,612
76Y	Unit Supply Specialist	CL	95	3,606
91B	Medical Specialist	ST	95	2,450
94B	Food Service Specialist	OF	85	2,984
95B	Military Police	ST	100	2,770
	Total			40,776

Table B-2

List of Variables

Dependent	
Attrition (stat)	- the stay/leave decision. 0 = remaining in the Army, re-enlisting, going to officers school or completing required (contracted) length of service. 1 = leaving the service prematurely.
Independent	
Military Occupational Specialty (MOS)	- The job contracted for during enlistment. Also the job the enlistee trains for.
Race	- Dummy Variable. White is the reference group. R2 = Hispanic. R3 = Black.
Sex (FMALE)	- Males are the reference group.
Black Female (BFMALE)	- Variable showing behavioral differences between black females and all other (white females, black males, and white males).
Education	- High School Graduate or better is the omitted category. NGRAD = non-high school graduate. GED = those with a Graduate Equivalency Diploma.
AFQT	- Score received in Armed Forces Qualifying Test. Scores of 11 to 50 are treated as a base line. Scores of 51 to 99 are treated as a continuous variable.

Table B-3

Elasticities of MOS Equations

Parameter	05C	11B	13B	16J
AFQT 50	-.050* (4.34)	-.045* (13.13)	-.035* (6.35)	-.143* (3.89)
Black	-.116** (22.95)	-.055** (15.29)	-.122** (29.92)	-.047 (1.25)
Black/Female	-.006 (0.28)	———	———	.006 (0.24)
DEP in Months	-.095** (8.45)	-.052** (8.49)	-.023 (0.59)	-.101 (1.18)
Female	.129** (70.4)	———	———	.122** (21.77)
GED	.024** (15.25)	.038** (86.92)	.022** (13.74)	.084** (6.84)
Nongraduate	.141** (98.59)	.124** (240.23)	.119** (89.36)	.101** (24.34)
Logit r	.251	.191	.194	.251

* = Significant at .05
** = Significant at .01
( ) = Chi square

Table B-4

Elasticities of MOS Equations

Parameter	31M	64C	67N	71L
AFQT 50	-.063* (4.74)	-.034* (6.13)	-.103 (2.20)	-.074** (11.17)
Black	-.129** (16.17)	-.064** (12.94)	-.025 (1.90)	-.146** (8.80)
Black/Female	-.0003 (0.00)	-.004 (0.61)	———	-.057 (2.23)
DEP in Months	-.119** (6.87)	-.070* (4.08)	-.258** (6.77)	-.070* (5.38)
Female	.201** (48.43)	.192** (119.68)	———	.364** (55.70)
GED	.017 (3.5)	.022* (8.07)	.026 (2.90)	.016* (6.06)
Nongraduate	-.063* (4.74)	.107** (65.51)	.098** (25.34)	.023 (17.22)
Logit r	.234	.230	.195	.202

* = Significant at .05
** = Significant at .01
( ) = Chi square

Table B-5

Elasticities of MOS Equations

Parameter	76P	76Y	91B	94B	95B
AFQT	-.018*	-.043**	-104**	-.018	-.164**
	(4.08)	(9.52)	(8.10)	(3.19)	(16.93)
Black	-.151**	-.199**	-.049	-.119**	.008
	(11.98)	(35.49)	(3.36)	(30.10)	(0.57)
Black/Female	-.056**	-.037*	-.042**	-.009	.009*
	(7.97)	(4.15)	(10.21)	(1.21)	(5.78)
DEP in Months	-.081*	-.060	-.099*	-.036	-.100*
	(6.17)	(3.78)	(4.89)	(1.98)	(5.75)
Female	.210**	.102**	.146**	.076**	.106**
	(69.38)	(19.92)	(37.86)	(29.80)	(91.77)
GED	.012	.022**	.025*	.005	.022**
	(3.55)	(11.52)	(5.60)	(0.49)	(13.00)
Nongraduate	.069**	.107**	.038**	.129**	.068**
	(66.47)	(63.14)	(20.75)	(59.97)	(60.81)
Logit r	.201	.213	.165	.192	.236

* = Significant at .05
** = Significant at .01
( ) = Chi square

Table B-6

Delayed Entry Program Statistics by MOS

MOS	Mean DEP time	Std. Dev.	% over 6 months
05C	2.1	2.1	9.9
11B	1.8	1.9	6.2
13B	2.0	2.0	8.1
16J	1.5	1.4	3.8
31M	1.8	1.7	5.5
64C	2.1	1.9	7.0
67N	3.1	2.5	19.6
71L	2.0	2.0	8.8
76P	2.6	2.4	16.0
76Y	1.9	1.9	7.7
91B	2.4	2.1	10.5
94B	1.6	1.7	4.6
95B	2.6	2.4	14.2

APPENDIX C

TOTAL LOSS MODEL

At times it may become necessary to assign DEP lengths that will minimize total loss rather than cost. This is particularly true if recruiting individuals who are particularly desirable but also supply constrained, a situation that has existed with male I-IIIA high school graduates. At these times, the Army may desire to minimize total loss even though cost is not at a minimum. It is here that the TL model may become particularly useful.

The total loss (TL) model describes the loss probability for an individual from the contracting point to the 2-year point of the first term, including both DEP loss (loss prior to accession) and attrition (loss after accession). TL is not simply the sum of the two probabilities. Since a person who becomes a DEP loss cannot also attrite, the attrition probability is conditional upon completion of the DEP. Therefore the model calculates the sum of the probabilities of DEP loss and attrition (weighted by 1 minus the DEP loss probability).

TL curves were calculated for supply categories in all 12 examined MOS. Figure C-1 shows TL curves for a typical male I-IIIA high school graduate in MOS 11X, 31M, and 71L. An MOS effect is clearly visible. Not only do the TL probabilities differ, but also the minimum loss points. In this case, minimum loss points in MOS 11X and 71L occur at 3 months while in MOS 31M it does not occur until 5 months. In these three MOS, the TL probabilities for this individual ranged between .22 and .30. For the same individual in other MOS, probabilities ranged from .15 (MOS 67N at 4 months DEP) to .37 (MOS 94B at 9 months DEP). A summary of probability ranges is included on Table C-1. This table shows lowest and highest loss probabilities by supply category across the 12 MOS. In general, male high school graduates and seniors had the lowest TL probabilities overall (with TL probabilities inversely related to AFQT). These groups were followed in order by male non-high school graduates, female seniors, and female high school graduates.

Figure C-2 displays graphically both the education and gender effects as well as the differing minimum loss points between supply categories within an MOS (in this case MOS 31M). As previously described, male seniors had the lowest loss probabilities and female graduates the highest. Different minimum loss points were found for each supply category. This was true for most MOS. Table C-2 provides a summary of minimum loss points for supply categories by MOS. It is clearly shown that variation occurs between supply categories and within supply categories across MOS. Among supply categories, the minimum loss points occurred at the shortest DEP lengths among male high school graduates and females and the longest among male nongraduates and seniors.

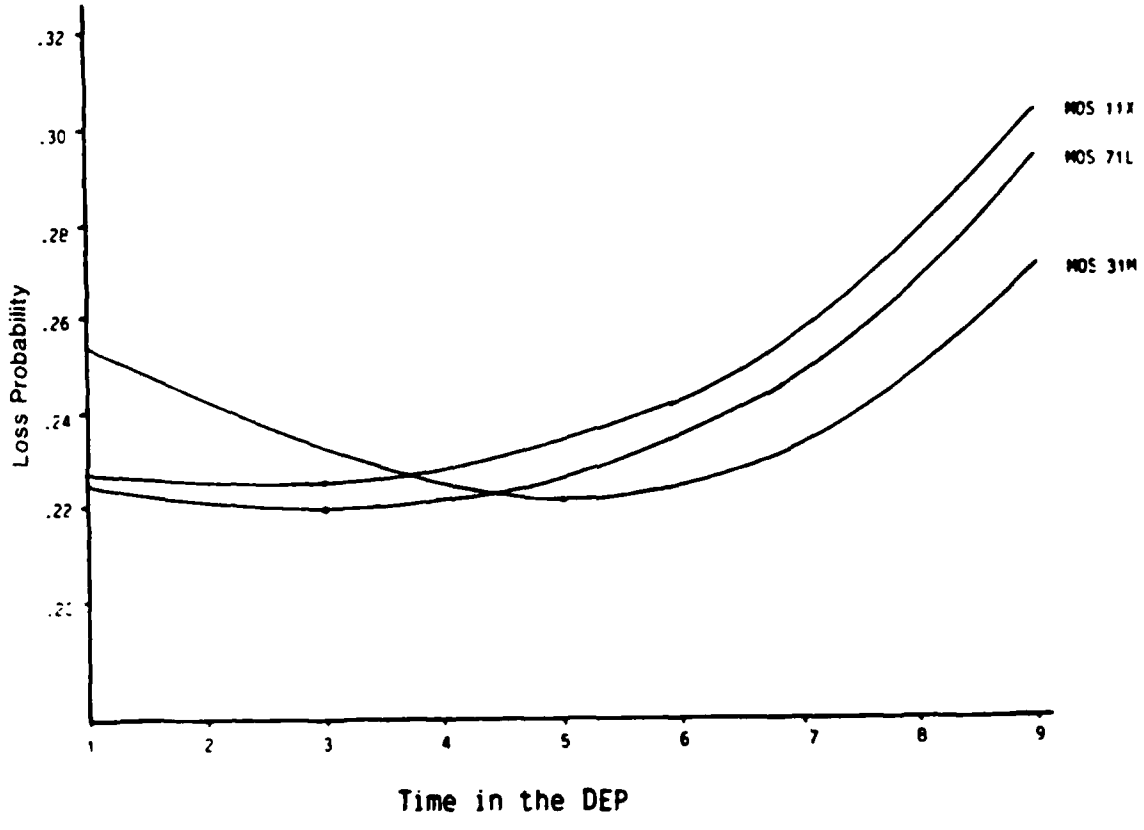

Figure C-1. Total loss curves.

Table C-1

Total Loss Probability Ranges Across MOS (Through 9 Months in DEP)

Supply group	TL Range	
	Low	High
Male I-IIIA H.S. Grad.	.150	.375
Male IIIB H.S. Grad.	.169	.403
Male IV H.S. Grad.	.170	.404
Male I-IIIA H.S. Senior	.134	.317
Male IIIB H.S. Senior	.148	.350
Male IV H.S. Senior	.147	.350
Male I-IIIA Non-H.S. Grad.	.308	.499
Male IIIB Non-H.S. Grad.	.340	.535
Male IV Non-H.S. Grad.	.342	.537
Female I-IIIA H.S. Grad.	.371	.606
Female IIIB H.S. Grad.	.418	.633
Female I-IIIA H.S. Grad.	.366	.546
Female IIIB H.S. Grad.	.408	.570

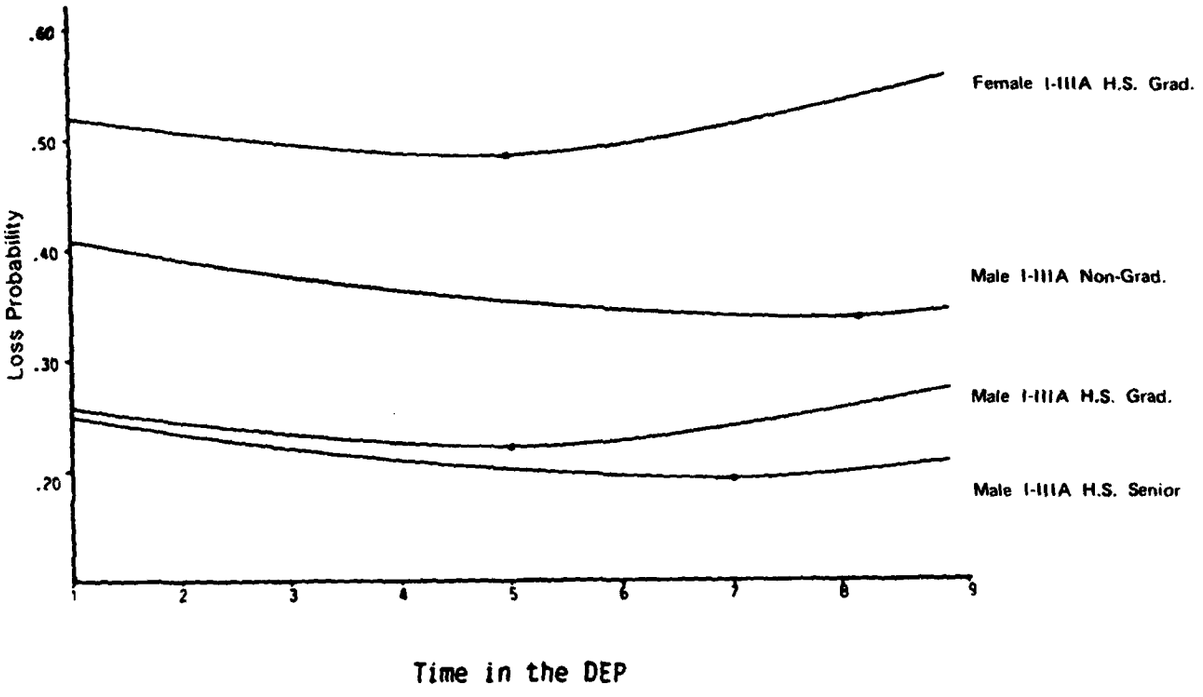

Figure C-2. Total loss curves.

Table C-2

Minimum Total Loss Point (in Months)

Supply category	MOS 05C	11X	13B	31M	64C	67N	71L	76P	76Y	91B	94B	95B
Male												
I-IIIA H.S. Grad.	4	3	1	5	3	4	3	2	3	3	3	3
IIIB H.S. Grad.	4	3	1	5	3	4	4	3	4	4	4	3
IV H.S. Grad.	4	3	1	5	3	4	4	3	4	4	4	3
Male												
I-IIIA H.S. Senior	6	5	2	7	5	6	5	4	5	5	6	5
IIIB H.S. Senior	7	5	2	8	5	6	6	5	6	6	6	6
IV H.S. Senior	7	5	2	8	5	6	6	5	6	6	6	6
Male												
I-IIIA Non-H.S. Grad.	7	5	1	8	5	7	5	4	5	6	5	6
IIIB Non-H.S. Grad.	8	5	1	8	5	7	6	5	6	6	5	7
IV Non-H.S. Grad.	7	5	1	8	5	7	6	5	6	6	5	7
Female												
I-IIIA H.S. Grad.	4	-	-	4	2	-	2	1	1	2	2	3
IIIB H.S. Grad.	4	-	-	5	3	-	2	2	2	2	2	3
Female												
I-IIIA H.S. Senior	5	-	-	6	3	-	3	2	3	3	3	4
IIIB H.S. Senior	5	-	-	6	4	-	4	3	3	4	3	5

APPENDIX D

MARGINAL SAVINGS

Appendix D presents the marginal savings of increasing an individual's DEP length by one month. Personnel supply category is written on top of the table. The symbol "*" denotes that no calculation is provided because the cell size was zero. Marginal savings are estimated on actual FY83 distributions.

Interpretation

The first column on the first page is for male AFQT category I-IIIA (50-99) high school graduate in MOS 05C (Radio Teletype Operator). 406.00 is the savings of going from 1 to 2 months. * means no one can be in the DEP longer than 12 months.

05C
406.00
393.00
380.00
367.00
350.00
331.00
308.00
279.00
245.00
203.00
155.00
*

APPENDIX D

	MALES		CATEGORY I-IIIA				HIGH SCHOOL GRADUATE				
05C	11X	13B	31M	64C	67N	71L	76P	76Y	91B	94B	95B
406.00	208.00	79.00	502.00	188.00	363.00	140.00	125.00	191.00	182.00	200.00	187.00
393.00	205.00	82.00	474.00	181.00	333.00	132.00	117.00	188.00	171.00	202.00	178.00
380.00	200.00	83.00	443.00	172.00	299.00	122.00	109.00	181.00	161.00	204.00	168.00
367.00	195.00	85.00	410.00	161.00	265.00	110.00	99.00	175.00	147.00	205.00	155.00
350.00	189.00	89.00	373.00	148.00	225.00	94.00	84.00	166.00	130.00	207.00	140.00
331.00	180.00	91.00	332.00	131.00	183.00	75.00	67.00	155.00	109.00	209.00	121.00
308.00	170.00	92.00	283.00	110.00	133.00	50.00	44.00	140.00	83.00	209.00	97.00
279.00	154.00	95.00	230.00	84.00	78.00	21.00	17.00	120.00	51.00	208.00	68.00
245.00	134.00	94.00	168.00	54.00	17.00	-15.00	-15.00	97.00	14.00	202.00	34.00
203.00	110.00	91.00	100.00	17.00	•	-55.00	•	67.00	-28.00	192.00	-7.00
155.00	81.00	84.00	29.00	-22.00	-115.00	-98.00	-91.00	34.00	-73.00	177.00	-49.00
•	•	•	•	•	•	•	•	•	•	•	•

	MALES		CATEGORY IIIB				HIGH SCHOOL GRADUATE				
439.00	228.00	92.00	560.00	221.00	413.00	164.00	149.00	222.00	208.00	216.00	229.00
429.00	226.00	96.00	535.00	215.00	381.00	158.00	144.00	219.00	201.00	219.00	222.00
417.00	222.00	101.00	507.00	209.00	347.00	151.00	137.00	218.00	191.00	223.00	214.00
406.00	220.00	106.00	476.00	200.00	312.00	140.00	128.00	214.00	179.00	229.00	204.00
392.00	216.00	113.00	440.00	190.00	271.00	127.00	117.00	210.00	165.00	234.00	193.00
376.00	211.00	121.00	401.00	177.00	228.00	111.00	102.00	204.00	146.00	241.00	178.00
356.00	203.00	130.00	354.00	160.00	177.00	90.00	84.00	196.00	124.00	246.00	160.00
331.00	192.00	139.00	301.00	139.00	121.00	64.00	61.00	183.00	95.00	251.00	135.00
299.00	176.00	146.00	•	113.00	59.00	32.00	33.00	166.00	61.00	252.00	107.00
259.00	156.00	151.00	•	82.00	•	-4.00	1.00	144.00	21.00	248.00	72.00
213.00	130.00	153.00	99.00	45.00	•	-42.00	-35.00	116.00	-21.00	238.00	33.00
•	•	•	•	•	•	•	•	•	•	•	•

	MALES		CATEGORY IV				HIGH SCHOOL GRADUATE				
439.00	228.00	93.00	561.00	221.00	413.00	164.00	149.00	222.00	209.00	216.00	229.00
•	225.00	96.00	535.00	216.00	381.00	158.00	•	220.00	200.00	220.00	222.00
418.00	223.00	100.00	506.00	208.00	347.00	150.00	137.00	217.00	191.00	224.00	214.00
406.00	220.00	107.00	476.00	200.00	311.00	140.00	128.00	215.00	179.00	228.00	204.00
392.00	216.00	114.00	440.00	190.00	272.00	127.00	116.00	210.00	165.00	235.00	193.00
•	211.00	121.00	401.00	177.00	•	111.00	103.00	204.00	146.00	241.00	•
356.00	203.00	130.00	•	160.00	•	89.00	•	195.00	123.00	247.00	159.00
•	192.00	139.00	•	139.00	•	64.00	61.00	183.00	•	•	•
•	176.00	146.00	•	113.00	•	32.00	32.00	•	•	•	•
•	•	152.00	•	•	•	•	•	•	•	•	•
•	129.00	•	•	44.00	•	-43.00	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•	•	•

	MALES		CATEGORY I-IIIA				NON-HIGH SCHOOL				
05C	11X	13B	31M	64C	67N	71L	76P	76Y	91B	94B	95B
572.00	313.00	143.00	610.00	287.00	•	194.00	204.00	255.00	257.00	245.00	316.00
581.00	321.00	155.00	600.00	290.00	612.00	197.00	208.00	262.00	259.00	257.00	324.00
589.00	329.00	169.00	587.00	293.00	594.00	199.00	211.00	268.00	260.00	268.00	330.00
598.00	340.00	184.00	571.00	296.00	573.00	201.00	216.00	276.00	262.00	282.00	338.00
606.00	351.00	202.00	553.00	301.00	549.00	203.00	220.00	283.00	263.00	297.00	345.00
614.00	363.00	221.00	533.00	303.00	525.00	205.00	225.00	292.00	263.00	313.00	353.00
620.00	374.00	243.00	511.00	308.00	498.00	207.00	•	299.00	264.00	329.00	360.00
•	387.00	266.00	486.00	310.00	469.00	207.00	234.00	308.00	262.00	347.00	367.00
•	398.00	290.00	•	312.00	439.00	207.00	•	314.00	261.00	363.00	373.00
625.00	409.00	315.00	428.00	312.00	406.00	206.00	•	320.00	257.00	380.00	376.00
620.00	416.00	339.00	396.00	311.00	371.00	202.00	239.00	324.00	251.00	394.00	378.00
•	•	•	•	•	•	•	•	•	•	•	•

	MALES		CATEGORY IIIB				NON-HIGH SCHOOL				
588.00	328.00	156.00	•	313.00	668.00	209.00	222.00	272.00	275.00	255.00	335.00
601.00	339.00	170.00	640.00	320.00	656.00	215.00	228.00	281.00	280.00	268.00	347.00
614.00	351.00	187.00	633.00	326.00	•	218.00	235.00	292.00	284.00	283.00	359.00
626.00	363.00	206.00	623.00	333.00	624.00	224.00	242.00	303.00	288.00	299.00	372.00
640.00	377.00	227.00	609.00	340.00	604.00	229.00	250.00	316.00	292.00	318.00	385.00
•	392.00	250.00	594.00	348.00	•	234.00	257.00	328.00	296.00	336.00	399.00
662.00	408.00	277.00	574.00	355.00	•	•	266.00	342.00	•	357.00	412.00
•	423.00	304.00	•	361.00	•	•	•	353.00	•	•	426.00
•	437.00	•	•	367.00	•	•	280.00	366.00	•	•	•
680.00	450.00	362.00	496.00	370.00	•	•	•	376.00	300.00	•	447.00
•	460.00	390.00	463.00	371.00	427.00	244.00	289.00	•	296.00	436.00	453.00
•	•	•	•	•	•	•	•	•	•	•	•

	MALES		CATEGORY IV			NON-HIGH SCHOOL					
•	330.00	159.00	•	315.00	669.00	210.00	•	273.00	276.00	257.00	337.00
604.00	341.00	172.00	641.00	321.00	•	215.00	•	283.00	281.00	270.00	349.00
617.00	353.00	190.00	634.00	328.00	•	221.00	•	294 00	286.00	286.00	361.00
630.00	366.00	209.00	624.00	335.00	•	225.00	244.00	306.00	289.00	302.00	374.00
•	381.00	230.00	611.00	342.00	•	230.00	251.00	318.00	294.00	320.00	•
655.00	395.00	255.00	•	350.00	•	•	•	•	•	•	•
•	411.00	281.00	•	•	•	•	•	•	•	360.00	•
•	426.00	•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•	403.00	•
•	•	•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•	•	•

	FEMALE		CATEGORY I-IIIA			HIGH SCHOOL GRADUATE		
05C	31M	64C	71L	76P	76Y	91B	94B	95B
705.00	780.00	398.00	235.00	241.00	277.00	291.00	311.00	404.00
734.00	779.00	415.00	234.00	245.00	280.00	288.00	333.00	421.00
766.00	773.00	434.00	229.00	245.00	282.00	279.00	360.00	441.00
798.00	757.00	452.00	222.00	245.00	283.00	269.00	389.00	459.00
828.00	733.00	471.00	210.00	241.00	279.00	253.00	420.00	476.00
849.00	693.00	483.00	194.00	233.00	271.00	230.00	448.00	489.00
858.00	637.00	490.00	170.00	219.00	256.00	200.00	471.00	493.00
845.00	565.00	482.00	140.00	197.00	235.00	164.00	483.00	485.00
807.00	477.00	461.00	104.00	170.00	204.00	121.00	480.00	461.00
741.00	378.00	422.00	67.00	•	167.00	76.00	459.00	421.00
653.00	278.00	370.00	29.00	99.00	127.00	31.00	419.00	366.00
•	•	•	•	•	•	•	•	•

	FEMALE		CATEGORY IIIB			HIGH SCHOOL GRADUATE		
727.00	812.00	429.00	262.00	272.00	313.00	323.00	328.00	434.00
765.00	826.00	455.00	267.00	281.00	325.00	325.00	357.00	464.00
807.00	832.00	485.00	270.00	291.00	335.00	325.00	390.00	496.00
•	833.00	517.00	271.00	299.00	347.00	321.00	428.00	531.00
891.00	822.00	549.00	269.00	307.00	355.00	313.00	467.00	567.00
924.00	795.00	577.00	262.00	309.00	360.00	299.00	507.00	598.00
943.00	752.00	597.00	248.00	306.00	357.00	278.00	538.00	•
•	•	•	226.00	293.00	346.00	•	560.00	•
•	•	588.00	197.00	272.00	321.00	209.00	562.00	•
•	•	•	160.00	240.00	•	•	•	•
•	•	•	•	201.00	242.00	•	501.00	•
•	•	•	•	•	•	•	•	•

	FEMALE		CATEGORY I-IIIA			HIGH SCHOOL SENIOR		
05C	31M	64C	71L	76P	76Y	91B	94B	95B
668.00	758.00	376.00	230.00	233.00	267.00	285.00	288.00	382.00
683.00	751.00	385.00	226.00	233.00	267.00	280.00	301.00	391.00
699.00	739.00	394.00	223.00	232.00	266.00	272.00	316.00	401.00
713.00	721.00	402.00	215.00	229.00	263.00	262.00	332.00	410.00
726.00	696.00	411.00	207.00	225.00	259.00	250.00	349.00	418.00
735.00	662.00	416.00	194.00	218.00	252.00	232.00	365.00	423.00
738.00	619.00	420.00	178.00	208.00	241.00	211.00	380.00	425.00
733.00	565.00	•	157.00	195.00	227.00	186.00	392.00	422.00
716.00	502.00	408.00	132.00	175.00	207.00	154.00	398.00	411.00
687.00	430.00	391.00	104.00	154.00	183.00	121.00	396.00	393.00
642.00	350.00	366.00	72.00	127.00	154.00	82.00	386.00	366.00
•	•	•	•	•	•	•	•	•

	FEMALE		CATEGORY IIIB			HIGH SCHOOL SENIOR		
679.00	782.00	397.00	251.00	257.00	296.00	312.00	297.00	401.00
•	•	412.00	252.00	261.00	300.00	310.00	314.00	417.00
722.00	785.00	427.00	252.00	265.00	306.00	308.00	332.00	436.00
742.00	777.00	444.00	252.00	268.00	309.00	302.00	352.00	•
•	764.00	•	249.00	271.00	313.00	296.00	375.00	474.00
781.00	741.00	476.00	243.00	271.00	313.00	284.00	398.00	492.00
•	•	•	•	•	312.00	•	419.00	•
•	•	•	221.00	263.00	•	•	•	•
788.00	•	499.00	203.00	•	•	•	•	•
•	•	•	•	•	•	•	•	•
•	•	•	•	214.00	254.00	•	•	•
•	•	•	•	•	•	•	•	•